

REMARKS

Claims 1-18 and 33-36 are currently pending in this application.

Response to Rejection of ClaimsClaim 1

Claim 1 is directed to a mass produced absorbent article. The absorbent article comprises an absorbent member adapted to retain liquid therein, at least one other component operatively connected to the absorbent member in a unit, and an image. The image includes at least one ink having the color of one of cyan, magenta, yellow and black, and at least one other ink having a different color of one of cyan, magenta, yellow and black. The image is printed in a non-contact manner on at least a portion of the at least one other component by ink jets at a resolution of about 100 dpi with the at least one other component moving under the ink jets at a speed of at least about 30.5 mpm (100 fpm). Any area in the image having a cyan colored ink applied at maximum threshold thereto has a coverage area ratio of cyan colored ink of at least about 3%, any area in the image having a magenta colored ink applied at maximum threshold thereto has a coverage area ratio of magenta colored ink of at least about 5%, any area in the image having a yellow colored ink applied at maximum threshold thereto has a coverage area ratio of yellowed colored ink of at least about 6%, and any area in the image having a black colored ink applied at maximum threshold thereto has a coverage area ratio of black colored ink of at least about 6%.

As mentioned in the specification, the recited article has an image that is darker (i.e., has more vibrant color) when the image is applied at high line speeds (e.g., 100 fpm or greater) even though the output of the print heads is set to dispense an

unconventionally low quantity of ink (100 dots per inch). In other words, the image on the recited article is more vibrant, brighter, and stands out better visually than those of the prior art even though it is formed at a high line speed and with less ink. See page 22, paragraph [0050] of applicants' specification. At least to the inventors, this was counterintuitive and a surprising result, the intuitive solution to increasing the line speed being to increase the ink output to keep up with the faster moving article.

In particular, as discussed at column 7, paragraph [0053] of the present application, the recited coverage area ratios represent a greater coverage area ratio than is typically achieved for a resolution of 100 dpi. The greater coverage area is achieved as a result of the higher line speed at which the printed component is moving.

Claim 1 is thus submitted to be nonobvious in view of and patentable over the references of record, and in particular, U.S. Patent No. 5,503,076 (Yeo) in view of U.S. Patent No. 6,680,784 (Nomura et al.), in that whether considered alone or in combination the references fail to show or suggest an absorbent article comprising an image including at least one ink having the color of one of cyan, magenta, yellow and black, and at least one other ink having a different color of one of cyan, magenta, yellow and black printed in a non-contact manner on at least a portion of the at least one other component by ink jets at a resolution of about 100 dpi with the at least one other component moving under the ink jets at a speed of at least about 100 fpm, and having the claimed coverage area ratios.

Yeo (with particular reference to Figs. 1 and 2 thereof), discloses a multi-color printed nonwoven web laminate 10 having a fibrous nonwoven facing layer 12, a substrate layer 14 and a plurality of adhesive-inks 16. The adhesive inks 16 adhesively

bond the facing layer 12 to the substrate layer 14, and impart a multi-color pattern which is visible through the nonwoven facing layer 12. Yeo further discloses that flexographic and ink-jet printing can be used to apply the adhesive inks 16.

As noted in the final Office action at page 3, Yeo does not disclose the coverage area ratios recited in claim 1. Rather, the Office takes the position that ink composition ratios described by Yeo are analogous to the coverage area ratios of claim 1. Specifically, the Office claims "Yeo does allow for the pigment to be used in the claimed range at set forth in col. 2, lines 59-60." See, page 3 of the final Office action.

The portion of Yeo cited by the Office refers only to the composition of the colored adhesive inks used in Yeo. The passage, column 2, lines 59-60, recites in part that the ink comprises on a dry weight basis about 50 to about 99.5 percent of a polymer and about 0.5 to about 50 percent of a pigment.

Claim 1 recites various coverage area ratios that are a function of the total area within a graphic that contains the respective color (cyan, magenta, yellow and black). The coverage area ratios clearly **do not refer to the ratio of the components of the ink**. Specifically, claim 1 recites, in part, that

**any area in the image** having a cyan colored ink applied at maximum threshold thereto has a coverage area ratio of cyan colored ink of at least about 3%, **any area in the image** having a magenta colored ink applied at maximum threshold thereto has a coverage area ratio of magenta colored ink of at least about 5%, **any area in the image** having a yellow colored ink applied at maximum threshold thereto has a coverage area ratio of yellow colored ink of at least about 6%, and **any area in the image** having a black colored ink applied at maximum threshold thereto has a

coverage area ratio of black colored ink of at least about 6%. Emphasis added.

The teaching of Yeo of an ink composition ratio thus clearly fails to teach the claimed coverage area ratios. Rather, the coverage area ratio is based on the dpi used to print a particular color, the speed at which the printed component is printed, and the total area of that portion of the image over which the color is printed. Moreover, col. 8, lines 20-23 of Yeo only disclose that the colored adhesive ink can be disposed in a discrete bond pattern "which means that the pattern covers less than 50% of the surface area of the substrate layer." This portion of Yeo thus likewise fails to teach the claimed coverage ratios in an image including at least one ink having the color of one of cyan, magenta, yellow and black, and at least one other ink having a different color of one of cyan, magenta, yellow and black.

Nomura et al. do not add to the teachings of Yeo. Rather, Nomura et al. disclose a printer 1 having a paper feeder 3 for supplying paper to the inside of the printer, a print engine 20 for printing, and a paper discharge feeder 4 for discharging paper to the outside of the printer. The printer 1 is a dot matrix printer with a nine-pin head configuration and having a print density of 90 dpi. During use, upon reception of data for printing in a density other than 90 dpi, the received data is converted to 90 dpi before printing by the printer 1. See, col. 2, lines 45-51. Error correcting means are also provided to correct errors that occur during the conversion of data to 90 dpi. See, col. 2, lines 63-67.

Nomura et al., which was relied on solely for its teaching of printing at 90 dpi, also fail to teach or suggest the recited coverage area ratios. Since Yeo and Nomura et al. each fail to

disclose or even suggest the claimed coverage area ratios, a combination of the references must also fail to disclose or suggest this feature. Thus, claim 1 is submitted to be nonobvious in view of and patentable over Yeo in view of Nomura et al.

Additionally, as noted in the final Office action, Yeo fails to teach that the adhesive ink can be applied at a resolution of about 100 dots per inch (dpi) as recited in claim 1. In fact, Yeo is completely silent regarding the number of dpi used to apply the adhesive ink to the article. Even more so, Yeo is silent as to any relationship between the resolution and the line speed of the component onto which the image is printed. Nomura et al. is completely silent as to a line speed at which the paper is moved past the print head of the printer. That is, one skilled in the art cannot glean from Nomura et al. that a 100 dpi resolution is achievable or beneficial for paper moving at the line speed recited in claim 1.

It is the combination of low resolution (i.e., 100 dpi) and high line speed (i.e., 100 fpm) at which the printing is occurring that renders the claimed invention patentable over the prior art including Yeo and Nomura et al. In other words, there is no reason evident in Yeo or Nomura et al. from which one skilled in the art would find it obvious to print images at a low resolution (e.g., 100 dpi) onto a component moving a high line speed (i.e., 100 fpm), or otherwise predictable that such a feature would result in the recited vibrant image. Furthermore, there is simply no suggestion in either Yeo or Nomura et al. for printing images at a low resolution (e.g., 100 dpi) onto a component having a high line speed (i.e., 100 fpm).

As set forth in the Declaration filed January 15, 2007, absorbent articles such as diapers and training pants are typically manufactured in a line process in which the various

components of the article are assembled together at high speeds such as 100 feet per minute (as mentioned in Yeo) and more often about 1,200 feet per minute or more. Prior to the present invention, due in part to print head limitations, graphic images that appear on such articles were applied by ink jet printing in an off-line process in which the graphic was imprinted on a film or non-woven web off-line, at lower speeds and over multiple passes of the web past the print head. The printed web was subsequently introduced to the manufacturing line at the higher line speed. The resolution of such images was about 300 dpi to about 600 dpi or even higher.

The quality of an image produced by a drop on demand ink jet printer has long been thought to be a function of the resolution of the image, i.e., a certain area of coverage of the substrate by the ink. The image resolution is typically defined in terms of the surface area of the web covered by a given amount of ink, and more particularly the ink dot density which is commonly given as dots-per-inch (dpi). A greater dpi has thus been associated with a greater resolution, and hence an increased quality ink jet image on the web. For example, the reference text submitted with the Declaration notes that conventional printing is typically performed at a resolution of 254-770 dpi, and for textile printing the resolution should be about 720 dpi.

The problem to be addressed by the inventors was to print at higher speeds than were available in off-line printing processes, while maintaining or increasing the resolution of the image printed on the web. Achieving this would allow the web to be printed on the main assembly line, i.e., at line speed, thereby reducing the number of processing steps, increased flexibility in changing graphics during manufacturing, and providing other manufacturing efficiencies and cost savings.

The teachings known to those skilled in the art at the time of the invention dictated that to maintain the image quality of the graphic at the desired higher line speeds, the resolution of the graphic image on the web would have to at least stay the same (e.g., 300 to 600 dpi), meaning that the print head would have to output more ink as the line speed increased. Neither Yeo nor Nomura et al. teach or suggest otherwise.

U.S. Patent No. 6,957,884, which is incorporated by reference into the present specification at paragraph [0043], page 17 as U.S. Patent Application No. 10/330,515, also discusses the shortcomings of ink jet printers. For example, the '844 patent states that "there has been much progress in the area of piezo jet printing however, heretofore, the piezo jet printers were limited in that they were not able to handle high-speed process printing" (col. 1, lines 38-41), and "piezo jet printing apparatus currently available lack the ability to create multi-color process images at high speeds" (col. 1, line 66 through col. 2, line 1). Applicants point out that the date of the '884 patent is closer to the date of the present invention than Nomura et al. and is submitted to be more indicative of the conventional wisdom in the art at the time of this invention than Nomura et al.

During experiments conducted by the inventors, however, the graphic produced at higher dpi (using faster print-head output and more ink) and higher line speed rates was blurred, or smeared. Also during these experiments, the inventors increased the line speed (at which the printing occurred) even further, thus exceeding the ink delivery rate capabilities of the print head to see just how high of a line speed the print head could be used with. Exceeding the capabilities of the print head certainly is not a solution that would have been obvious to one skilled in the art. Indeed, this resulted in the image

resolution dropping substantially below 300 dpi. Unexpectedly and unpredictably, the quality of the image was as good as, or better than, images previously produced at 300-600 dpi and slower line speeds and certainly better than images produced at 300-600 dpi at the higher line speeds.

As a result of their experimentation, the inventors determined that high quality images could be produced on absorbent articles moving at line speeds of 30.5 meters per minute (100 feet per minute) or greater using ink jet printing with a resolution of about 100 dots per inch (dpi). Such a result was unpredictable and unexpected in view of the previously common belief that increasing line speeds required a more rapid ink delivery rate (relative to the line speed) to the web, not a lower rate.

The position taken by the Office in this final Office action is that it would have been obvious to modify Yeo in view of the teachings of Nomura et al. to have the recited image of Yeo printed at 100 dpi because the recited resolution according to Nomura et al. can be used to produce an excellent quality image. However, Nomura et al. fail to disclose the rate at which the paper moves (e.g., the line speed of the paper) past the print head and further fail to disclose or suggest any relationship between the image resolution and the line speed. Based on the commonly understood relationship between resolution, line speed and image quality in a conventional dot matrix printer at the time of applicants' invention, one would expect that the paper movement speed in Nomura et al. would have to be relatively low (i.e., substantially slower than 100 fpm).

The Office's position thus goes against the commonly understood relationship between resolution, line speed, and image quality at the time of the applicant's invention. As discussed previously herein and in the previously attached



declaration, the recited image having a resolution of 100 dpi unexpectedly provides the desired image quality that was heretofore achieved only at higher resolutions and lower line speeds. Indeed, Nomura et al. specifically disclose that as the print speed increases, the quality of the printed image decreases. See, col. 1, lines 13-19. Accordingly, the recited reduced resolution, at higher line speeds, is counterintuitive and contrary to the teachings of the prior art and the knowledge of those skilled in the art at the time of the present invention.

For all of the above reasons, claim 1 is submitted to be non-obvious in view of and patentable over the references of record including Yeo in combination with Nomura et al.

Claims 2-18 depend either directly or indirectly from claim 1 and are submitted to be patentable over the references of record for at least the same reasons as claim 1.

#### Claims 2 and 3

Claims 2 and 3 each depend directly from claim 1 and further recite higher coverage area ratios for cyan, magenta, yellow and black, respectively. As disclosed at Table 2 of the present application, when the printing resolution is 100 dpi, the coverage area ratio of the printed image is achieved only at higher line speeds. However, as discussed above in connection with claim 1, operating at such high line speeds while printing at a low resolution (e.g., 100 dpi) is against conventional wisdom prior the present invention.

Accordingly, for at least the same reasons set forth above in connection with claim 1, claims 2 and 3 are further submitted to be patentable over the references of record.

Claims 11 and 12

Claim 11, which depends indirectly from claim 1, further recites that the image includes multiple separable design elements, none of the design elements being smaller than about 0.64 centimeters (0.25 inches) in height. Claim 12 depends from claim 11 and further recites that one of the design elements constitutes a focal design element, the height of the focal design element being at least about 1.91 centimeters (0.75 inches).

Neither Yeo nor Nomura et al. disclose the dimension of a design element, nor would it would have been obvious to one of ordinary skill in the art to modify Yeo or Nomura et al. on the basis that discovering the optimum value of a result effective variable involves only routine skill in the art. See page 4 of the final Office action citing *In re Boesch and Slaney*.

Such a position appears to be the very position rejected by the court in *In re Antonie* 195 USPQ 6 (CCPA 1977). In particular, the court noted that an assertion that it would always be obvious to one of ordinary skill in the art to try varying every parameter of a system in order to optimize the effectiveness of the system is improper "if there is no evidence in the record that the prior art recognized that particular parameter affected the result." *Id.* at 8 (emphasis added). Thus, the court made it clear that the recognition of a particular parameter as a result-effective variable must come from the cited reference.

In this case, neither Yeo nor Nomura et al. teach that the dimension of the design element is a result-effective variable.

For these additional reasons, claims 11 and 12 are further submitted to be non-obvious and patentable over the references of record.

Claim 33

Claim 33 is directed to a mass produced absorbent article comprising an absorbent member adapted to retain liquid therein, at least one other component operatively connected to the absorbent member in a unit, and an image including at least one ink having the color of one of cyan, magenta, yellow and black, and at least one other ink having a different color of one of cyan, magenta, yellow and black, the image being printed in a non-contact manner on at least a portion of said at least one other component by ink jets at a resolution of about 100 dpi with the outer cover moving under the ink jets at a speed of at least about 30.5 mpm (100 fpm), wherein a color difference ( $DE^*$ ) value for any cyan colored ink in the image as compared to a background color of said at least one other component on which the image is printed is at least about 6, the  $DE^*$  value for any magenta colored ink in the image has a color difference ( $DE^*$ ) of at least about 9, the  $DE^*$  value for any yellow colored ink in the image has a color difference ( $DE^*$ ) of at least about 8, and the  $DE^*$  value for any black colored ink in the image has a color difference ( $DE^*$ ) of at least about 6.

Claim 33 is submitted to be non-obvious in view of and patentable over the references of record, and in particular Yeo in view of Nomura et al., for reasons similar to those discussed above in connection with claim 1. That is, whether considered alone or in combination the references fail to teach or suggest the recited absorbent article wherein the image including at least one ink having the color of one of cyan, magenta, yellow and black, and at least one other ink having a different color of one of cyan, magenta, yellow and black printed in a non-contact manner on at least a portion of the at least one other component by ink jets at a resolution of about 100 dpi with the outer cover moving under the ink jets at a speed of at least

about 30.5 mpm (100 fpm), and the claimed color difference (DE\*) values.

As noted in paragraphs [0049-0052] and Table 2 of the present application, the color difference values are generally a function of the dot resolution and the speed at which the printed component is moved past the printer. The color differences claimed in claim 33 are achieved at a 100 dpi resolution by using a faster line speed than conventional wisdom would suggest as discussed above. Thus, one skilled in the art would not have been motivated to provide the recited color difference values at such a low resolution (100 dpi).

For the above reasons, claim 33 is submitted to be non-obvious in view of and patentable over the references of record.

#### Claim 34

Claim 34 depends from claim 1 and further recites that the image contains ink applied to said at least one component by the ink jet with dots having a uniform volume of ink.

Yeo lacks any teaching or suggestion whatsoever regarding the sizes of the dots used during ink jet printing. Instead, the portions of Yeo cited by the Office in rejecting claim 34, col. 4, lines 8-22 and col. 8, line 66 to col. 9, line 10, are only directed to a general description of ink jet printing.

As a result, claim 34 is submitted to be further non-obvious in view of and patentable over Yeo in combination with Nomura et al.

#### Claim 35

Claim 35 depends from claim 1 and further recites that the image comprises ink dots of generally uniform size. As mentioned with respect to claim 34, Yeo lacks any teaching or suggestion whatsoever regarding the sizes of the dots used

during ink jet printing. Instead, the portions of Yeo cited by the Office in rejecting claim 35, col. 4, lines 8-22 and col. 8, line 66 to col. 9, line 10, are only directed to a general description of ink jet printing.

As a result, claim 35 is submitted to be further non-obvious in view of and patentable over Yeo in combination with Nomura et al.

#### Claim 36

Claim 36 depends from claim 1 and recites that the at least one other component comprises a non-woven material, the image being disposed on the non-woven material.

Those skilled in the art of printing will readily appreciate that printing on non-woven material is more difficult than printing on standard paper because of the substantial higher void space of the non-woven material. During the printing process, a significant amount of ink is captured by the voids in the non-woven material which inhibits the ink from spreading laterally outward. Again, the conventional wisdom in the art of printing, prior to this invention, would be to add more ink to compensate for the ink being captured by the voids.

While Yeo discloses printing on non-woven material, one of ordinary skill in the art would not be motivated by Nomura et al. to print on a non-woven material at 100 dpi because doing so goes against the conventional wisdom in the art. Nomura et al. is directed specifically to printing on paper which is much denser and has much less void space. As a result, it is easier to print on paper than a non-woven material because ink is not captured by the voids. Instead, the ink is held near the surface of the paper where it is clearly visible. Thus, it takes less ink to print on paper than on non-woven material to achieve the same, or nearly the same, quality image.

Accordingly, one of ordinary skill in the art at the time of this invention would not be motivated to print on a non-woven as taught by Yeo at a high line speed and 100 dpi as disclosed by Nomura et al. because the skilled artist would have believed a significantly greater dpi would be necessary to achieve a quality image.

For these additional reasons, claim 36 is submitted to be further non-obvious in view of and patentable over Yeo in combination with Nomura et al.

#### Conclusion

In view of the foregoing, applicants respectfully request allowance of this application.

Applicants do not believe that any fee is due. However, the Commissioner is hereby authorized to charge any deficiency or credit any overpayment of fees to Deposit Account No. 12-384.

Respectfully submitted,

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